SOIL GAS SURVEY
PLANT NO. 3
NWIRP BETHPAGE, NEW YORK
CONTRACT NUMBER N62472-90-D-1298, CTO 0089

1.0 Background Information

During the Phase 1 RI activities, trichloroethene (TCE) at a concentration of 58,000 ug/l was found in groundwater at a depth of approximately 140 to 160 feet below grade surface (bgs) to the south and west of Plant No. 3 (HN-24I). The most significant contamination in this area appears to be associated with a 10-foot thick clay layer at this depth. Based on the TCE concentration, this contamination is also potentially DNAPL (dense non-aqueous phase liquid) in nature. Also supporting the potential DNAPL concept is the lack of significant TCE contamination in the shallower groundwater at this location. Several potential sources of this contamination are currently being investigated. These sources include Site 1, Plant No. 3, and offsite areas hydraulically upgradient of the NWIRP (north and west).

To address the potential source areas in Plant No. 3, a soil gas survey of the soils beneath the floor was conducted on March 17 and 18, 1993. This work was conducted as part of the Phase 2 Remedial Investigation (RI) and a Feasibility Study (FS) to address environmental contamination at the Naval Weapons Industrial Reserve Plant (NWIRP), Bethpage, New York. A Phase 1 Remedial Investigation was completed in May 1992. The Phase 2 RI/FS is currently underway. The primary purpose of the soil gas survey was to identify or eliminate potential source areas of subsurface chlorinated organic (TCE) contamination associated with the interior of Plant No. 3.

In October 1992, the Navy and Halliburton NUS conducted a visual inspection of Plant No. 3 for potential source areas of TCE contamination. The inspection did not indicate the presence of any major source areas of TCE contamination. However, several potential minor source areas of TCE were noted, (see Figure 1).

In January 1993, two intermediate-depth monitoring wells (160 feet bgs) were installed near the HN-24I, (HN-24I1 and HN-24I2 - see Figure 2). Based on preliminary data from these wells, the potential for Site 1 to be the source of the contamination at HN-24I has been reduced (but not eliminated). This is based on the findings that groundwater in a well (HN-24I1) located between HN-24I and Site 1 was found to have a significantly lower TCE concentration than the groundwater at either Site 1 or HN-24I. Also, the clay layer associated with the contamination in HN-24I was not observed in HN-24I1. The preliminary results from HN-24I2 (located nearer Plant No. 3) found both the clay layer and TCE concentrations similar to those found in HN-24I. This data indicates that the source of this contamination may be further north than HN-24I2 (Plant No. 3) and/or further north and west (Navy warehouses and Hooker/RUCO).

Another observation (from recently obtained Hooker/RUCO soil boring log sheets) is that this clay layer (and associated contamination) may extend north and west towards the Hooker/RUCO Superfund Site.

The following sections describe in detail the soil gas survey procedure and results for the Plant No. 3 soil gas survey.

2.0 Survey Rationale and General Approach

The purpose of the soil gas survey was to determine if there are source areas of solvent-contaminated soils in Plant No. 3. Additionally, this data could be used to supplement the Phase 1 RI soil gas survey and determine the need for remediation of soils under Plant No. 3. An organic vapor analyzer (OVA) was used to provide real-time readings of the amount of total organic compounds in the soil gas at each sampling location. This soil gas survey was designed to be a relatively non-intrusive, preliminary field screening technique.

The current and historic uses of Plant No. 3 were reviewed by Grumman and Halliburton NUS personnel to identify potential source areas of solvent contamination to be investigated during the soil gas survey. A total of 32 soil gas readings were obtained in or near each of the known or suspected areas where solvents were used and/or stored in Plant No. 3. Sampling locations are shown on Figure 1. To determine the relative significance of positive soil gas detections, the readings were compared to background OVA readings obtained from presumably clean areas of Plant No. 3. Of the 32 sampling locations, five points were used to determine background soil gas levels in Plant No. 3. The background soil gas samples were obtained in roughly the four corners of the plant, the north central portion of the plant, and at least 100 feet away from any potential source area.

A minimum of one soil gas point was placed in each potential source area. Additional soil gas points were located in selected areas based on size of the process unit and the initial soil gas result for that area. Small non-complex areas required only a single point to demonstrate the presence or absence of a contaminant source. For larger areas, one high soil gas reading (e.g. 10 to 15 ppm above background) was used to confirm the presence of a source. However, several consistently low soil gas readings located across a large potential source area were required to confirm that the area was not a source.

Potential interferences to the survey results include the following: contamination from the groundwater and variations in the building foundation allowing the vapors to concentrate in certain areas or migrate horizontally away from a source area. Factors considered in selecting this test method included the estimated concentration of solvents in the shallow groundwater underneath Plant No. 3 being relatively low (except for the southeast corner which is Site 1-related) and groundwater being relatively distant from the foundation (50 to 60 feet bgs - except for some of the secondary containment sumps which are 20 to 40 feet below grade). At an approximate soil temperature of 50°F, pure TCE (DNAPL) has a vapor pressure of about 50,000 ppm-v, whereas TCE in water at 100 ug/l has a corresponding vapor pressure of 7 ppm-v. Also, the vapor densities of chlorinated solvents that are found in the groundwater at the site, are heavier than air and would tend to remain near the water table.

3.0 Sampling Methodology

The soil gas survey procedure consisted of drilling a hole through the concrete building foundation, driving a steel rod into the underlying soil, extracting the rod, and extracting a soil gas sample through a hollow wand attached to a Century model 128 organic vapor analyzer (OVA). Each soil gas boring was completed by drilling a 5/8-inch hole through the concrete floor or wall using an electric, 20-lb, rotary/percussion hammer. Water was sprayed

onto the drill bit and cuttings during drilling to minimize dust generation. All drill cuttings were collected and placed in onsite trash receptacles. A 1/2-inch steel rod was driven into the underlying soils to approximately 3 feet below the floor using the rotary/percussion hammer. The steel rod was extracted using pipe wrenches.

A 4 foot length of 1/4-inch copper tubing was inserted to near the bottom of the borehole and connected to the OVA by a 2 foot length of clear, flexible plastic tubing. The annular space at the top of the borehole was temporarily sealed with putty. The OVA was used to extract a soil gas sample through the tubing into the OVA sample chamber and the real-time readings of soil gas levels were recorded. The highest reading obtained at each location was recorded. Between sampling locations, the tubing was purged using the OVA until non-detect readings (ambient air) were obtained. Prior to sampling, the response time of the OVA was determined to be approximately 17 seconds using a known source (marker pen). Upon completion, all boreholes were backfilled to the surface with non-shrink groute.

4.0 Soil Gas Survey Results

The soil gas survey was conducted at all areas identified in the Work Plan, except for the pit in the Heat Treat Area in the Northwest corner of Plant No. 3 (locations 27 - 31). The concrete in this pit was greater than 18 inches thick, (which is the limit of the drill bits available at the time). This area is the location of a current TCE tank, with TCE transported to and from this area in 55-gallon drums. This area was constructed in the 1980's.

In addition, the concrete was not penetrated in two of the five locations (locations 22 and 25) in a former TCE tank area (Wash and Degrease Area) just south of the Heat Treat Area and at the Plating Shop (location 2). The use and handling practices of TCE at Wash and Degrease Area is very similar to that used at the Heat Treat Area. This area was also constructed in the 1980's. The Plating Shop is currently in operation and is not believed to have used solvents. Because of test results from points near these locations, the lack of results for these particular locations is not significant.

During the testing it was reported that currently the structures at the honeycomb cleaning area are significantly different than those present during historic operations. Currently, the area is an open bay with no significant surface features. It was reported that the area used to consist of equipment in a recessed area, approximately 8 feet deep. During the dismantling of this unit, the recessed area was filled with soil and a concrete cap (current plant floor) was placed over it. The soil gas results obtained were from within this capped area and therefore may not reflect what is below the sump area.

The results of the soil gas survey are presented on Table 1 and Figure 3. Areas of highest soil gas readings included the former honeycomb cleaning area (29 to 88 ppm), paint tunnel number 4 (18 ppm), paint tunnel number 6 (30 ppm), the zyglo inspection area (11 ppm), the flo-coat line (> 100 ppm), and the tetrachloroethene (PCE) recovery area (2.4 to 12 ppm). Readings of greater than 10 ppm were obtained from all of these areas. Readings of about 10 ppm or less were not considered significant, because of natural organics such as methane and offgasing from contaminated groundwater in this area.

The evaluation of the soil gas results includes a comparison of the chemicals used at each area versus the chemical TCE found in HN-24I, the volume and method of solvent use, and the soil-gas result obtained relative to background conditions.

The paint tunnels use non-chlorinated solvents such a toluene and methyl ethyl ketone as a paint thinner. The paints are sprayed onto parts and allowed to dry. A water-based spray curtain is used to treat the paint overspray and air for the ventilation system. Solvents are present in this area in 55-gallon drums.

The zyglo process may use a 1,1,1-trichloroethane-based or a non-chlorinated based solution, (TCE and PCE are not believed to be used in this process). Parts are dipped into the solution and then visually evaluated for surface defects under specific light conditions.

The former honeycomb cleaning area is reported to have used significant quantities of TCE (13,000 gallons per year). The exact process and configuration is uncertain.

The flo-coat and PCE recovery area currently use/recovery PCE. Parts are dipped into tanks containing the flo-coat material. The flo-coat material consists of a mixture of PCE and a rubbery material. The mixture is a thick viscous semi-fluid. Excess material is allowed in drip off back into the tank as well as onto the concrete floor adjacent to the tank. The coating is allowed to dry (PCE is volatilized) and baked. The PCE recovery system treats the offgases from the flo-coat line.

5.0 Conclusions and Recommendations

The conclusions developed from this study are as follows.

1) Based on the history of the facility and soil gas results, most areas of Plant No. 3 can be eliminated as potential sources of the contamination at HN-24I. These areas are as follows.

- Alodine, Former Heat Treat, and Plating Shop Area
- Wash and Degrease Area
- Former Printed Circuit Area
- Zyglo Inspection Area
- Paint Tunnels
- Former Paint Tunnels
- Former Chem Mill Area
- PCE Recovery and Former Sulfuric Acid Anodize Area

2) The only potential source area of HN-24I contamination from within Plant No. 3 identified during this study is the Former Honeycomb Cleaning Area. The testing in this area did not penetrate a reported sump and as a result it is uncertain if contamination exists underneath the sump.

3) Final conclusions cannot be developed for the Heat Treat Area, because testing was not conducted. However, soil gas results from an area within 50 feet and hydraulically downgradient of the Heat Treat

Area sump were 0.5 ppm and less. This indicates that the Heat Treat Area sump may not be a potential source of HN-24I contamination.

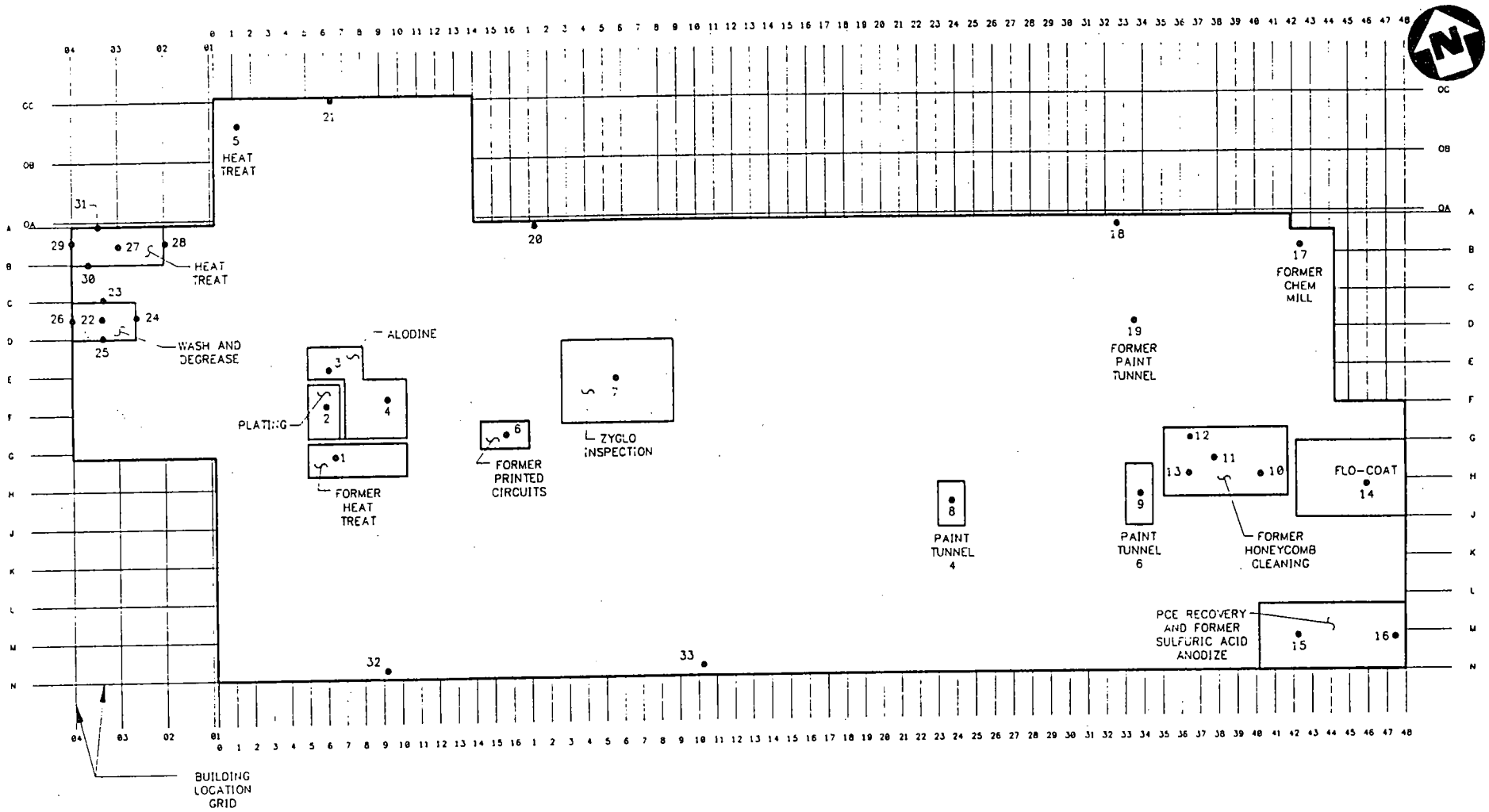
4) The elevated soil gas readings at the Flo-Coat Area may result from PCE used in the process. Also note that this area is immediately adjacent to Site 1, which was found to have similar elevated soil gas results.

The recommendations from this study are as follows.

1) Perform Gas Chromatograph testing of the soil gas at the Flo-Coat Area (location 14).

2) Perform Gas Chromatograph testing of the soil gas at the Honeycomb area. Two samples should be collected within the sump (locations 10 and 11) and two locations should be collected just south and approximately 8 to 10 feet below the floor surface (below the sump).

3) Perform Gas Chromatograph testing of the soil gas at the Heat Treat Area (location 27).



SAMPLING LOCATIONS
PLANT 3
SOIL GAS SURVEY – PHASE 2 RI/FS
NWIRP, BETHPAGE, NY

FIGURE 1

HALLIBURTON NUS
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WELL CONSTRUCTION DETAILS

WELL No.	ELEVATION (FEET msl) TOP OF PVC	DEPTH OF BORING (FEET)	SCREENED INTERVAL	DATE COMPLETED
HN24-S	122.73	59	48.6 - 58.6	09-04-91
HN24-I	121.78	158	148 - 158	10-25-91
HN25-S	125.69	59.3	49 - 59	09-05-91
HN25-I	125.51	130.4	120 - 130	11-21-91
HN25-D	124.82	210	200 - 210	01-22-92
HN26-S	125.00	55.0	44 - 54	09-05-91
HN26-I	124.84	155	115.3 - 125.3	10-30-91
HN27-S	128.21	54.3	44 - 54	09-04-91
HN27-I	128.59	155	100 - 110	11-04-91
HN28-S	122.82	54.3	44 - 54	09-03-91
HN28-I	122.73	155	131 - 141	11-08-91
HN29-S	119.04	49.3	39 - 49	09-04-91
HN29-I	116.42	130.4	120 - 130	11-26-91
HN29-D	115.11	220.0	210 - 220	01-08-92
HN30-S	129.10	57.3	47 - 57	09-05-91
HN30-I	126.27	155	110 - 120	10-21-91
HN08-D	125.91	198.4	188 - 198	12-19-91

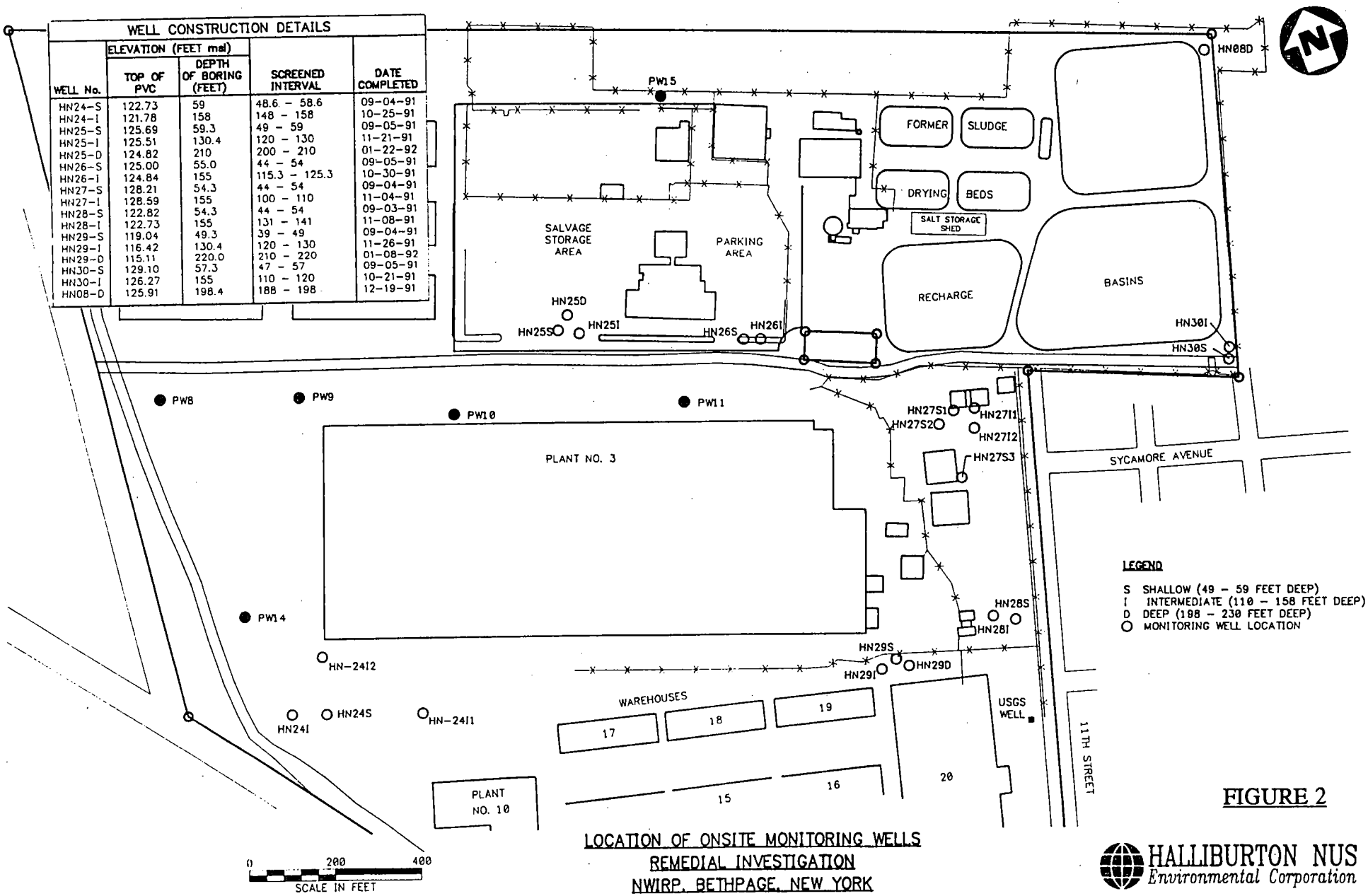
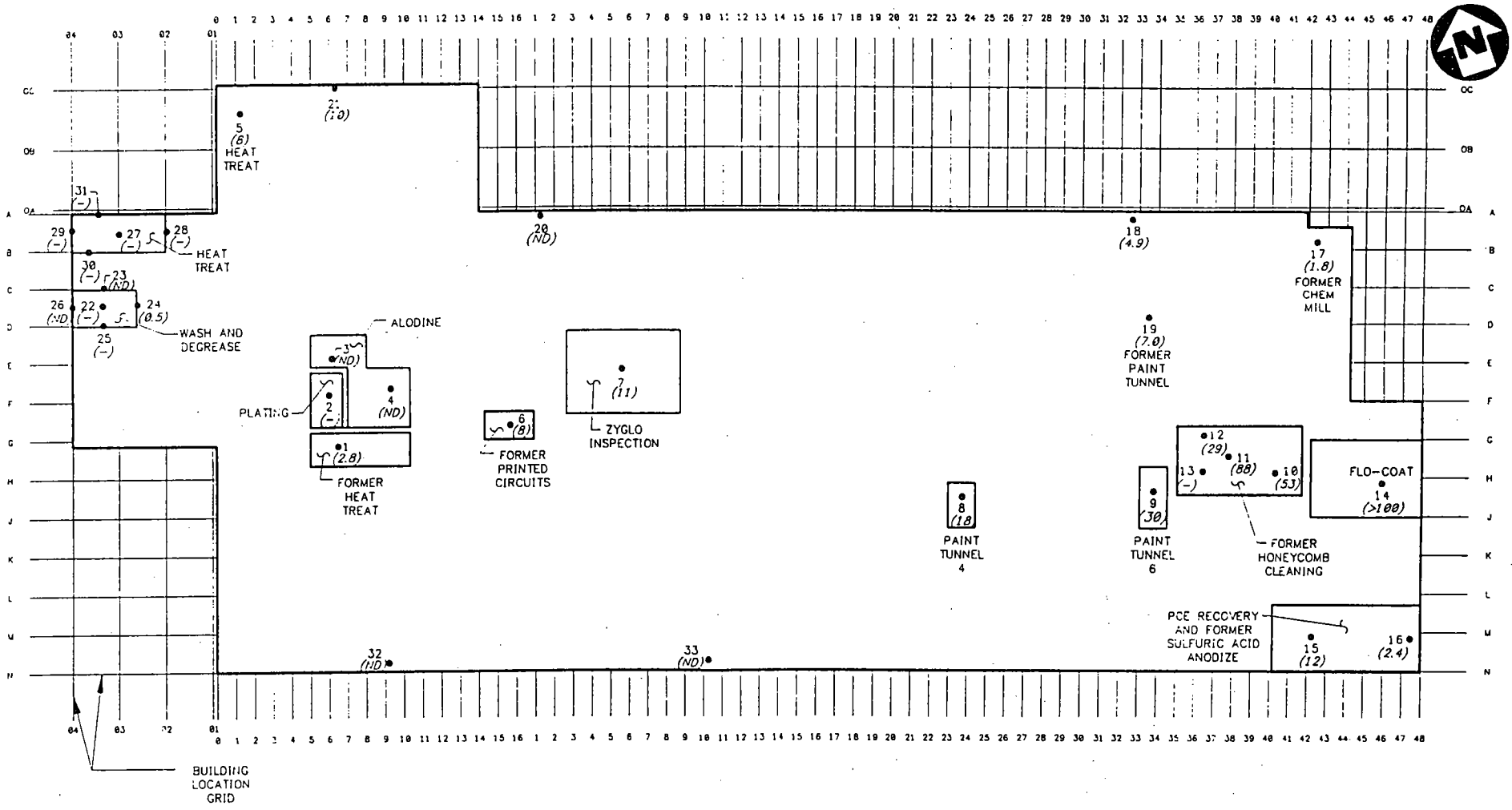


FIGURE 2

LOCATION OF ONSITE MONITORING WELLS
REMEDIAL INVESTIGATION
NWIRP, BETHPAGE, NEW YORK

HALLIBURTON NUS
Environmental Corporation



LEGEND

- SAMPLING LOCATION
- 20 (4.2) OVA READING – ppm
- (–) NOT MEASURED
- (ND) NON DETECT

RESULTS
PLANT 3
SOIL GAS SURVEY – PHASE 2 RI/FS
NWIRP, BETHPAGE, NY

APPROXIMATE SCALE
0 100 200
SCALE IN FEET

FIGURE 3

HALLIBURTON NUS
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TABLE 1
SOIL GAS SURVEY RESULTS
PLANT NO. 3
NWIRP BETHPAGE, NEW YORK

Sample Location Number	Building Coordinates (Fig. 2)	OVA Reading (ppm)	Sampled Depth (fbf)	Comments
1	G6	2.8	2.5	Former heat treat area
2	F6	--	--	Concrete >18 inches thick, no penetration
3	E6	ND	2.5	Alodine area
4	F9	ND	2.5	Alodine area
5	OC1	8	3	Adj. to heat treat, above ground tanks outside
6	G14	8	3	Former printed circuits area, adj. to paint locker
7	E6	11	2.5	Zyglo inspection area
8	H23	18	3	Paint tunnel #4 (MEK)
9	H32	30	3	Paint tunnel #6 (MEK). Zeroed out 5 ppm background in air
10	H40	53	3	Former honeycomb cleaning area. Inside a filled in secondary containment unit.
11	H38	88	2.5	Same as above, hit something at 2.5 feet
12	G36	29	3	Same as above, thin (4") concrete
13	--	--	--	Did not sample, adj. locations had high readings (Nos. 10, 11, and 12)
14	H45	>100 60 sustained	3	Chem mill, flo-coat line. Drilled through the drip-dry floor. Zeroed out 6 ppm background in air
15	M42	12	3	Former sulfuric acid anodize area, current PCE recovery area. Near Site 1 and significant GW contamination.
16	M48	2.4	3	Same as above
17	B42	1.8	2.5	Former chem mill, current shot peen
18	A32	4.9	3	Background sample, Machine shop, permasol-60 drum

	Building Coordinates (Fig. 2)	OVA Reading (ppm)	Sampled Depth (fbf)	Comments
19	D33	7.0	3	Machine shop, flammable waste drum marshalling area
20	A1	ND	3	Background sample, near outside doors
21	OC6	10	3	Background sample, machine shop
22	A04	--	--	TCE solvent tanks, wash and degrease pit, floor, concrete >18 inches thick - no penetration
23	A04	ND	3	Same as above, south wall
24	A04	0.5	3	Same as above, east wall
25	A04	--	--	Same as above, north wall, concrete > 18 inches thick - no penetration
26	A04	ND	3	Same as above, west wall
27	A02	--	--	Heat treat, pit floor, concrete > 18 inches thick - no penetration
28	A02	--	--	Wall, no penetration
29	A02	--	--	Wall, no penetration
30	A02	--	--	Wall, no penetration
31	A02	--	--	Wall, no penetration
32	N9	ND	3	Background sample, behind stairwell, near outside doors
33	N10	ND	3	Background sample, drill and rivet machine shop

fbf - feet below floor
-- - not measured, concrete too thick
PCE - tetrachloroethene
ppm - parts per million
MEK - methyl ethyl ketone
ND - non detect
TCE - trichloroethene